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contains about eight volumes per cent. more CO_2 than the left heart. It seemed to us that the electromotive force resulting from the difference in potential might exert an influence differing from the ordinary pharmacological action of the carbonates and be, at least, a factor in the maintenance of heart beat.

The exact condition of the CO_2 in the blood is not known. The fact that part is in solution and part is in combination renders a mathematical presentation only approximate.

Eight volumes per cent. CO_2 equals 80 volumes per liter. Calculated from H as 0.0896 grams this would equal 1.9712 grams CO_2 and equal 2.7777 grams of H_2CO_3 , or approximately the equivalent of $N/10$ H_2CO_3 between the left and the right sides of the heart. Assuming this to be ionized we should have an electromotive force represented by the formula below.

$$(\text{Jones}) \quad \pi = .0002 \frac{u-v}{u+v} T \log \frac{C_1}{C_2}$$

at 25°C . or since the valence of the positive negative ions may vary

$$(\text{Jones}) \quad \pi = \frac{\frac{c}{v} - \frac{a}{v'}}{\frac{c}{v} + \frac{a}{v'}} 0.0002 T \log \frac{P_1}{P_2}$$

To test the theory we perfused several mammalian hearts (cats') with blood oxygenated on one side and carbonated on the other. The technical difficulties of keeping the two separate were not completely overcome, but sufficiently so to convince us that there was no effect aside from the usual carbonate action.

Parts of the turtle ventricle or the whole heart was split so that each end could be immersed in a separate saline bath through which CO_2 and O could be forced. One end was bathed in CO_2 and the other in O . The whole was so arranged that a tracing could be recorded.

The results obtained were no different from those with the mammalian heart. The addition of NaHCO_3 gave the same action irrespective of whether it was added to either or both sides of the heart. Our results would indicate that the difference in CO_2 between the left and right sides of the heart has no

influence on the rate or strength of the beat of the isolated organ.

This does not preclude the probability that CO_2 has an influence direct or indirect on the heart beat of the intact animal. Its known action on the dissociation of hemoglobin and the probable similar action on other salts renders the view highly probable that carbon dioxide is a factor in the automatism of the heart.

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THE INFLUENCE OF CHEMICALS IN STIMULATING THE RIPENING OF FRUITS

VARIOUS chemical and physical methods of bringing on latent physiological processes in plants have long been known. Buds have been brought into full blossom for commercial purposes weeks before their natural time by the application of anesthetics, and Molisch has lately accomplished the same result by the use of hot water. The Arabs have also applied cloths moistened with vinegar to bunches of dates in order to "sweeten up" retarded fruits.

Following this lead, the writer has succeeded in ripening the fruit of a seedling date into a perfect commercial product in less than three days. The flavor of the chemically stimulated fruit is fully equal to that of the best naturally ripened, and a much greater evenness of ripening is obtained than when left on the tree. The sprays of fruit are subjected to the vapor of acetic acid for twelve or fifteen hours. At the end of this time they have become transparent nearly to the seed and will then ripen naturally without further treatment. The process can be accelerated by exposing them to sunshine, or more rapidly by heating for some hours to forty-five degrees centigrade. The process, it is anticipated, will permit the shipping of dates green and ripening them at their destination as bananas are now handled.

The fresh ripe date is very soft and prone to sour quickly, while the unripe fruit is very firm and not easily bruised. Furthermore, the

ripe, fresh date deteriorates very rapidly in flavor, due largely to the inversion of the cane sugar. For example, the unripe fruit of the seedling used in these experiments contains fifteen or twenty per cent. of cane sugar when ready to ripen, but very soon after complete ripeness this cane sugar disappears. This is due to the release of the intracellular invertase at the time of ripening. Much of the fine quality of the delicious Deglet Noor date is due to the nearly complete absence of invertase, which allows the cane sugar to remain permanently as such. By artificial ripening at their destination, the more inferior invert sugar varieties can be placed upon the table of the distant consumer with their maximum quota of cane sugar and consequently of flavor.

After moderate treatment with acetic acid, the tannin of the date has not yet become entirely insoluble but all astringency disappears in the next few hours. The intracellular invertase, however, passes into solution to quite an appreciable extent immediately after the treatment, and probably other intracellular or insoluble catalytic agents, are released simultaneously. The ripening processes are initiated not only by acetic acid, but also by a number of other chemicals such as acetic ether vapor, which acts practically as well as acetic acid but greatly impairs the flavor. Soaking some hours in a solution of potassium acetate stimulates the process in a very marked way but ammonium acetate has very little effect. Potassium sulphate shows no action. Oxalic acid shows a slight effect, while its homologue, succinic acid, has a very marked action. Benzoic and salicylic acids, and the acid amides (at least as regards acetamid) act promptly. The vapor of hydrochloric acid is without effect, but dates exposed to this acid for two days responded to acetic vapor. A detailed study of the effects of various groups of reagents is being made and the results will be published as soon as completed.

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NOTES ON THE PARASITISM OF *CYTODITES NUDUS*
AND *HÆMAPHYSALIS CHORDEILIS*¹

I. *Cytodites nudus*.

Among the many varieties of acariasis found in the United States, that produced by *Cytodites nudus* is comparatively rare. Furthermore, in the cases where *Cytodites* has been mentioned in this country, in Europe and in Australia, it has usually been described as a parasite of the trachea, lungs, air sacs and other respiratory passages of fowl and pheasants. Gerlach,² however, has attributed to it enteritis of poultry, and Zundel³ considers these mites as the causative agents of enteritis and peritonitis, and Holzendorff⁴ also found *Cytodites* embedded in the liver and kidneys of diseased fowls. It is the purpose of the present note to describe the conditions of infection observed by the writer in two cases of acariasis caused by *Cytodites nudus*, occurring in the yards of the Rhode Island Agricultural Experiment Station at Kingston.

The first case was that of a female golden pheasant. On December 21 it was observed that the bird was unable to walk, ate little, and showed a slight diarrhea. On December 22 a dose of castor oil was administered. From this time on the bird failed in strength, but lost very little flesh until it died on January 4, on which date the *post mortem* examination was made.

The internal organs were, as a whole, normal, except for the lungs, which were slightly congested. The heart was normal, though the most of the pericardial fluid appeared to have escaped into the thoracic cavity. Inside the pericardium, and on the surface of the heart itself, were a large number of round whitish bodies, about .5 mm. in diameter, which were recognized upon microscopic examination as identical with *Cytodites nudus*. Upon

¹ Contribution No. 6 from the Division of Biology of the Rhode Island Agricultural Experiment Station, Kingston, R. I.

² Gerlach, *Magazin für Thierheilkunde*, Berlin, 1859.

³ Zundel, *Journ. de Med. Veterinaire*, Lyons, 1864.

⁴ Holzendorff, *Archiv für wissenschaft. und prakt. Theilk*, 1885.